

Peter McCarthy

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Principal Engineer

I have many years experience in designing and developing software and systems. I have built a diverse range of full-stack solutions for Cloud (AWS), Desktop (Windows, Linux), Mobile (Android, iOS, iPadOS), Wearable (Android Wear, watchOS) and IoT, using a wide variety of runtimes, languages, frameworks, models (AI), databases and tools. I also have experience in leading developers and managing projects, and have started and run my own small business.

Currently, I am researching and developing in technology areas such as **agentic AI** and **MR / VR**.

I am someone who can think differently and solve problems in innovative ways. I am very creative, love to build things, have a flair for design, and possess great attention to detail. Also, I am self-motivated and self-taught, hard-working, trustworthy, and am constantly striving to improve myself.

Skills

Languages

Application

- C / C++
- C#
- Java / Kotlin (Android)
- Swift
- JavaScript ES6 - ES2021
- TypeScript
- Python

Presentation

- HTML5
- CSS3

Query

- T-SQL
- XPath

Frameworks, Libraries & APIs

Frameworks / Libraries

- COM / ActiveX
- .NET (Framework, Core)
- ASP.NET (Web API 2, SignalR)
- Core Bluetooth, Nearby Interaction (iOS / iPadOS / watchOS / tvOS)
- Qt 5
- React.js
- React Native
- Angular
- jQuery / jQueryUI

Libraries (C / C++)

- FFmpeg (video)
- libyuv (graphics)
- LVGL (embedded graphics)
- SDL (multimedia)
- LIVE555 (RTSP)
- ZeroMQ (messaging)
- libusb (USB connectivity)

APIs (C / C++)

- POSIX (Linux)
- Win16 / Win32, WinRT (Windows)

AI

Open Source Models

- Llama (language)
- Mistral (language)
- Vicuna (language)

Platforms & Runtimes

Platforms

PC

- Windows 3.1 - 11

- Stable Diffusion (image generation)
- SAM (image / video segmentation)
- LLaVA (vision)
- Whisper (speech)

Libraries / APIs

- Pytorch
- Transformers (Hugging Face)

Data

Databases

- SQL Server 6.5 - 2005
- PostgreSQL
- MySQL
- SQLite
- Access 7.0 - 2002
- Berkeley DB
- DynamoDB

Formats

- JSON (including JSON Schema)
- XML (including DTD)
- CSV

User Interface

PC

- GDI / WinForms / WPF (Windows)
- UWP (Windows)

Mobile

- Material (Android)
- SwiftUI (iOS / iPadOS / watchOS)
- React Native (Android, iOS)

Web

- HTML5
- CSS3
- JavaScript ES6 - ES2021
- PWA
- Chrome Extension

Communications

Protocols

- Serial (RS-232 / 422 / 485)
- UDP, TCP/IP (Sockets)
- HTTP
- WS (Web Sockets)
- RTSP

Messaging

- Linux (Ubuntu 18.04 - 22.04)
- ChromeOS
- macOS Sonoma

Mobile

- Android Jelly Bean - 10
- iOS 17.5 / iPadOS 17.5

Wearable

- Android Wear 2.0
- Apple Watch 9 (watchOS 10.5)

SBC

- Raspberry Pi (1 - 4; Zero 2 W)

IoT

- Monnit (sensors)
- Disruptive Technologies (sensors)
- Particle Photon

Cloud

- AWS: EC2, Lambda, S3
- Hugging Face Hub

Containerization

- Docker

Runtimes

- Node.js 0.10.x - 20.x
- .NET (Framework 1.0 - 4.8, Core 1.0 - 3.0, 8.0)
- Java (Android, J2ME, SE)
- Swift
- Web Assembly (WASM)

Tools

Development

IDE

- Android Studio
- Visual Studio (Professional, Code)
- Xcode
- Swift Playgrounds
- Chrome / Firefox (JavaScript debugging)
- Code::Blocks

- ZeroMQ
- MQTT

Wireless

- Wi-Fi
- Bluetooth (GATT, L2CAP)
- UWB (Apple U2)
- RFID (Texas Instruments TIRIS)
- IR

Wired

- RS-232 / RS-422 / RS-485
- Digital I/O
- USB

- Qt Creator

Compilers

- gcc
- Emscripten

Editors

- Notepad++

Source Control

- Git (GitHub)
- Visual SourceSafe

Command Line

- bash (cp, mv, rm, grep, etc.)
- curl / wget
- ssh / scp
- npm
- git

Productivity

- Google Workspace (Docs, Sheets, Slides)
- Office 365 (Word, Excel, PowerPoint)
- Inkscape
- GIMP

Programming Models

- Asynchronous (promises, async / await)
- Multithreaded (mutexes, semaphores)
- Multiprocess (message queues)
- Concurrency (threads)
- Parallelism (actors)

API Design & Implementation

Shared Library

- SO (Linux)
- DLL (Windows)

Network

- HTTP (REST, SSE)
- TCP/IP (Sockets)

Career

April 2021-present: Promethean Limited

After leaving Nationwide Produce to pursue new challenges, I joined Promethean Limited <https://www.prometheanworld.com/gb/>.

Role

- **Principal Engineer** (2023-present). In this role, I continue to research emerging and existing software (and occasionally hardware) technologies for future products, and develop proof-of-concepts for demonstration (to senior management) and hand-over (to development teams).

A large percentage of the work I have undertaken so far is in the field of **AI**, particularly Large Language Models (text generation) and Diffusion Models (images generation). I am also working with Apple mobile and wearable technologies; investigating how - for example - Ultra-wideband (UWB) can

be utilised for spatial computing applications.

As a Principal, my work has influence on the direction of product development

- **Senior Software Engineer** (2021-2023). In this role, I researched emerging and existing software (and occasionally hardware) technologies for future products, and developed proof-of-concepts for demonstration and hand-over

Technologies

- **Platforms:** Windows, Linux, Chrome OS, Android, iOS / iPadOS / watchOS / tvOS
- **Tools:** Visual Studio (Professional, Code), Android Studio, Xcode, Swift Playgrounds; Qt Creator
- **Languages:** C / C++, C#, Java (Android), Swift, Python, JavaScript ES2021
- **Open Source**
 - **AI APIs;** Hugging Face Transformers and Diffusers, OpenCV
 - **AI Models;** Vicuna 13B, LLaMA, Llama 2, Mistral 7B, SD 1.4-2.1, SDXL (Turbo), ControlNet, SAM, LLaVA 1.5, Whisper
 - **Libraries;** libusb, FFmpeg (libavcodec), libyuv, SDL2
- **Frameworks:** React.js (JavaScript), Core Bluetooth and Nearby Interaction (Swift); Qt 5
- **Frontend:** Web (HTML5, CSS3, JavaScript ES2021, WASM); Android (Material); SwiftUI
- **Backend:** Node.js, Python
- **Communications:** HTTP (REST, SSE), WS (Web Sockets), USB (Bulk Transfer), Bluetooth (GATT, L2CAP); UWB
- **Cloud:** AWS, Hugging Face Hub, Telegram

2018-2021: Nationwide Produce PLC

After closing-down Bibbol Ltd, I joined Nationwide Produce PLC <https://www.nationwideproduce.com>.

Role

- (Full-stack) Software Developer

Project Highlights

- I designed and developed a number of **mobile-driven solutions** to support the operation of the business in key areas such as product sales, quality control, warehouse picking and stock control
 - At the **frontend**, the systems are written in Java (Android), React Native (Android, iOS), React.js, vanilla HTML / CSS / JavaScript, and C# (WinForms)
 - At the **backend**, the service-oriented systems are written in C#, using ASP.NET Core - utilising Web API 2 (for REST) and SignalR (for real-time). SQL Server and T-SQL (procs, views, functions) are used to store and query data
- As well as designing and developing, I provided out-of-hours support for the systems if required. I also authored technical specifications and user guides

2008-2018: Bibbol Ltd

After self-employment, I decided to return to the field of retail Loss Prevention & Security, and I founded Bibbol Ltd.

Roles

- Founder / Director
- Software Developer

Project Highlights

- **Watchman.** A wearable solution for receiving instant (text and photo) notifications triggered by alarms and suspicious activity
 - Comprised server software written in JavaScript (with a HTML / CSS configuration Web UI), running on Node.js, installed on a Raspberry Pi 3 Model B device. SQLite was used to store notification data
 - Comprised client software written in Java, running on multiple Android Wear 2.0 smartwatch devices
 - Client-server communication was performed via ZeroMQ and HTTP (REST), and data was exchanged using JSON
 - I conceived, designed and developed the solution. I also demonstrated the solution to Sainsbury's, and later forged a partnership with a global tagging business to supply the solution with their own Electronic Article Surveillance (EAS) solutions. Subsequently, the partner demonstrated the solution to a number of UK, European and US retailers
- **Podium.** A mobile solution for controlling a retailer's CCTV system
 - Comprised server software written in C (with a HTML / CSS configuration Web UI), installed on a Raspberry Pi 2 / 3 Model B device
 - Comprised client software written in Java and C / C++, running on an Android Jelly Bean / Kit Kat tablet device. To receive, store and render live video, heavy use was made of the FFmpeg and LIVE555 libraries (via Android NDK)
 - Client-server communication was performed via ZeroMQ and HTTP (REST), and data was exchanged using XML and JSON
 - I conceived, designed and developed the solution. I also demonstrated the solution to Asda, Sainsbury's and Matalan, with interest shown from Next, TK Maxx and One Stop. Furthermore, I forged a partnership with a global tagging business to supply the solution with their own Electronic Article Surveillance (EAS) solutions
- **Bespoke.** I was also been involved with designing and developing a small number of bespoke solutions for other businesses, including:
 - **IoT in Retail.** A proof-of-concept for integrating Disruptive Technologies' sensor cloud solution <https://www.disruptive-technologies.com> with the cloud solution of a global tagging business. It comprised server software written in JavaScript, running on Node.js, installed on a Linux VM in Microsoft Azure cloud. It also comprised client software written using Ionic and Angular, running on multiple mobile (Android and iOS) devices. A combination of HTTP (REST) and Socket.io was used for client-server communications. (Cloud) servers communicated using HTTP (REST, SSE)

2002-2008: ingeniosys

I left Gratte Brothers Security Management Ltd to pursue new career challenges, and worked as a self-employed individual (ingeniosys) while helping to raise a young family.

Roles

- Owner
- Software Developer

Project Highlights

- **On-line Shopping.** I designed and developed, from scratch, a complete online shopping system for the sale of fresh meat and delicatessen produce. This was written in C# and ASP.NET and made use of Microsoft Web Service Enhancements (WSE) 3.0 for secure SOAP communications
- **Websites.** I designed and developed a small number of websites, during which I improved my skills in HTML, CSS, JavaScript, and PHP (with Server Side Includes)
- **Mobile Gaming.** Some 5 years before the iPhone and the App Store, I developed a small number of games for Nokia and Sony mobile phones. These were written in Java (running on J2ME) and were uploaded to a number of app stores for OTA distribution

2000-2002: Gratte Brothers Security Management Ltd

I joined Gratte Brothers Security Management Ltd after its acquisition of Secure Solutions Ltd's development team and systems technology.

Roles

- Development Manager

Project Highlights

- **Sentinel.** On acquisition, the TIGRIS system was renamed to Sentinel and then customised for use in Tesco stores only. I helped to extend the system's functionality, using .NET and C#, which was rolled-out to over 600 stores. The system is still in operation in many stores today
- **PnP for CCTV.** Before the advent of IP cameras, I worked with Tesco and JVC to create a Plug and Play (PnP) protocol specification for serial communications (RS-422 / RS-485) for CCTV cameras. The specification included protocols for camera discovery and control (pan / tilt / zoom / focus), and was successfully implemented by JVC (with other manufacturers, such as Pelco, considering its implementation)

1991-2000: Secure Solutions Ltd

I joined Secure Solutions Ltd shortly after graduating from the University of Liverpool.

Roles

- Software Developer
- Systems Architect
- Development Manager

Project Highlights

- **RACE** (Reactive Audit Capture and Evaluation). A retail Loss Prevention & Security system that provided CCTV camera control, Point of Sale (PoS) checkout monitoring, and cash-room monitoring
 - Ran on MS-DOS 5.0
 - Written in C
 - Serial (RS-232 / RS-485) networking

- Piloted in 3 Tesco stores
- I helped to develop the system, from scratch, with one other software developer and a hardware engineer. I was also involved with supporting the system (telephone and remote desktop)
- **TIGRIS** (Totally Integrated Graphical Retail Information System). A retail Loss Prevention & Security system
 - Ran on Windows 3.1 - XP
 - Written in C, C++, VB6 and HTML / CSS / JavaScript
 - Serial (RS-232 / RS-485), UDP / TCP/IP and RFID networking
 - Comprised the following configurable modules:
 - **Control**; provided control of CCTV cameras
 - **PoS**; monitored Point of Sale checkouts for possible incidents of employee theft
 - **TrolleyTrak**; tracked the movement of trolleys (via Texas Instruments' TIRIS RFID technology) to detect possible incidents of customer walk-out theft (i.e. leaving a store without paying)
 - **Queue Management**; combined PoS and TrolleyTrak to predict customer queues and alert checkout supervisors (via pagers) in advance
 - **ANPR**; monitored vehicle license plates at petrol filling stations
 - **Incident Database**; provided a customer theft reporting tool
 - TIGRIS TrolleyTrak was piloted in 11 Morrisons stores
 - TIGRIS Queue Management was piloted in 1 Tesco store
 - TIGRIS Control and PoS was piloted in a small number of Asda and Safeway stores
 - TIGRIS Control, PoS, ANPR and Incident Database, was rolled-out into over 300 Tesco stores
 - I helped to architect and develop the system, from scratch, with other software developers and hardware engineers. I was also involved in supporting the system (pager / telephone and remote desktop). I later became responsible for the development team and assumed the role of Development Manager
- **Hardware**. I was involved in the design, manufacture and system integration of a small number of in-house developed RACE / TIGRIS hardware devices (such as CCTV camera control joysticks and PoS interface units)

Education

1988-1991: University of Liverpool

- BSc (Hons) 2:1 Computer Science

1986-1988: St John Rigby RC 6th Form College, Orrell

- 'A' Level Grade **B** Computer Science
- 'A' Level Grade **C** Art (practical and history)
- 'A' Level Grade **D** Mathematics

1981-1986: St Thomas More RC High School, Wigan

- 7 'O' Levels (Grade **B** Mathematics, Grade **C** English, Grade **C** Computer Science)

Personal

- **Date of Birth:** 8th July 1970
- **Marital Status:** Married
- **Interests:** Technology (AI, MR / VR), current affairs, music (rock), podcasts, movies, reading (fiction / non-fiction) and sport (cricket, F1)
- **Achievements:** I taught myself to code at the age of 13 (C64 BASIC, 6502 assembly). Also, I helped to build a house between the ages of 13 and 16
- **Other:** I have a full, clean driving licence. I am in excellent health (I take no medication). Also, I am a non-smoker